SHIP-TO-SHORE CONNECTOR (SSC)
ANALYSIS OF ALTERNATIVES OVERVIEW

Ship Design Process Workshop

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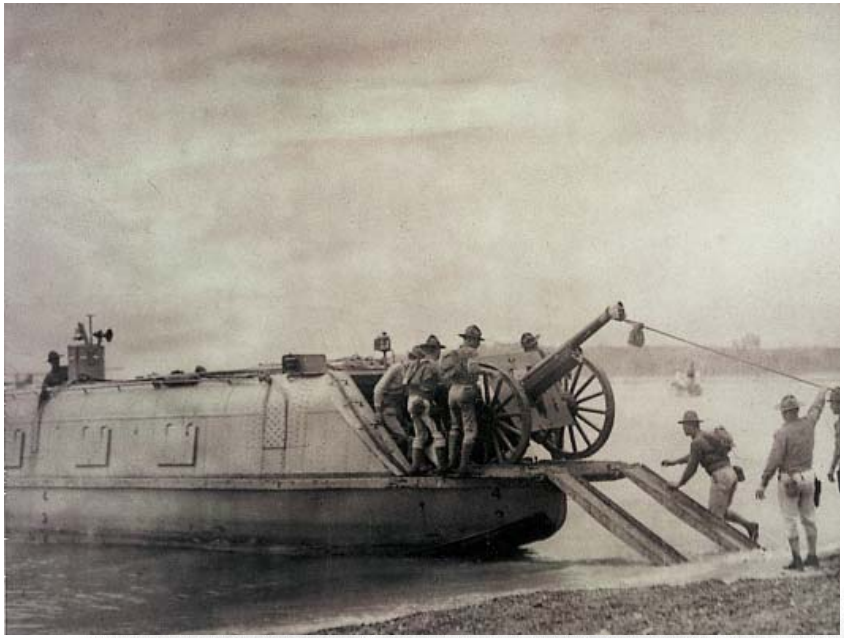
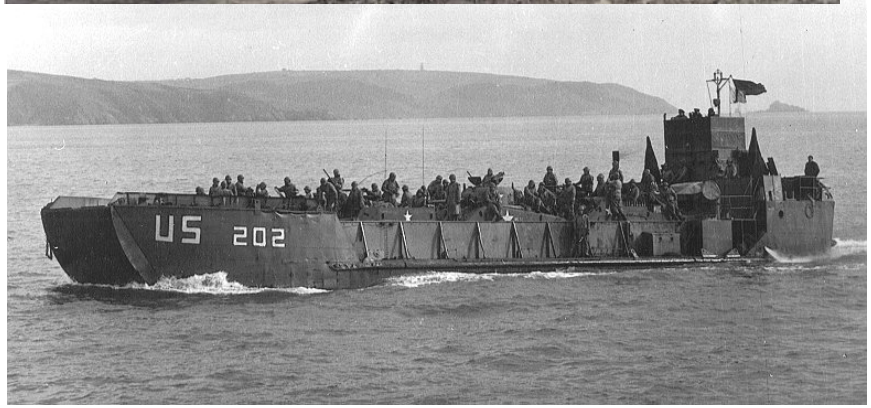
Agenda

- SSC Program Overview
- SSC Design Process
- SSC Analysis of Alternatives (AoA)
- SSC AoA Design Issues
- SSC & Proposed Implementation of SECNAVINST 5000.2D
- Conclusion

WHAT'S A SSC?

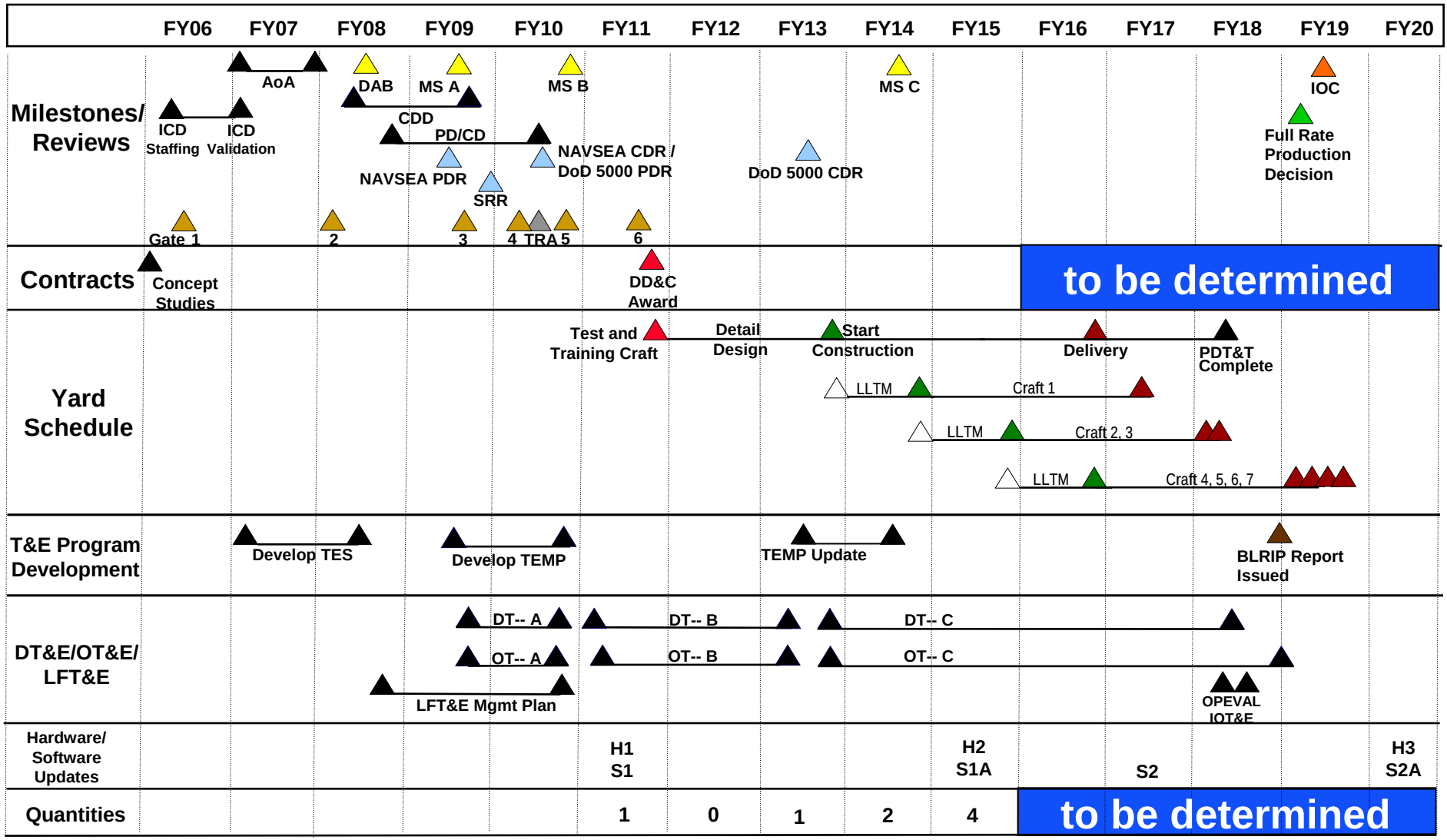




The LCAC replacement, aka

- LC(X);
- LCAC(X);
- HLCAC;
- Seabase-to-Shore Connector (SSC);
- Joint Maritime Assault Connector (JMAC);
- Ship-to-Shore Connector (SSC)

SSC Notional Schedule



Colors are for viewing ease

SSC Design Process

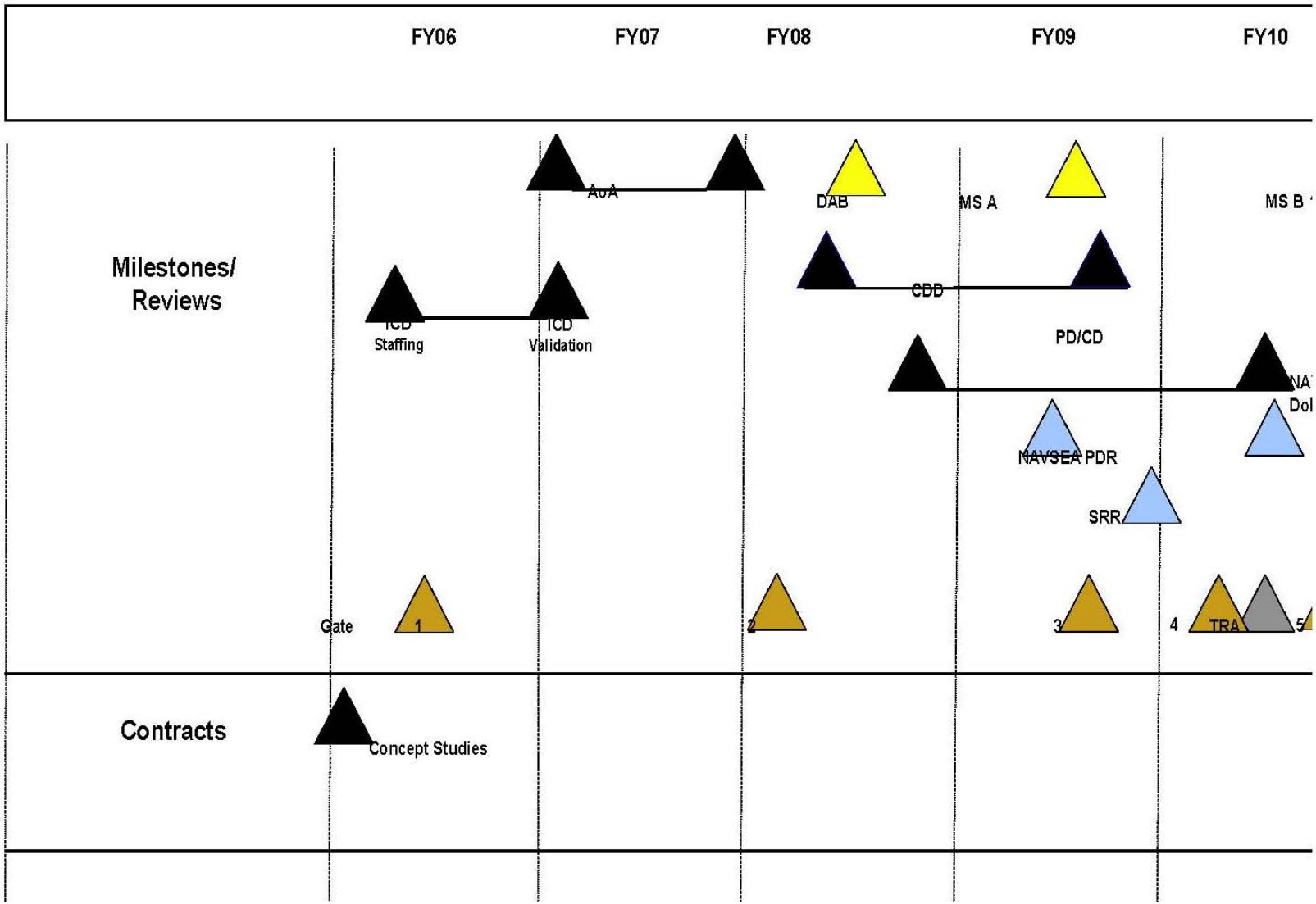
Return to Government led design

SSC in midst of changes to acquisition and design processes

Design phases

- **Analysis of Alternatives (Dec 06 - Nov07)**
- **Set-based Design Phase (Apr08 - Oct08)**
  - **Key trade-off studies performed leading to the selection and location of major equipment and functions**
  - **Selection of alternatives delayed as long as possible to ensure the impacts of all trades are sufficiently developed and effectively analyzed**
  - **Design space narrowed to identify a set of feasible, integrated craft designs that span range of CDD threshold through objective trade-space**
  - **Selection of alternatives made at craft level, not system**
  - **Preferred baseline design selected based on performance/cost/schedule/risk**
- **Preliminary Design (Oct08 - Apr09)**
  - **Point design iterations – complete all engineering**
- **Contract Design (May09 - Apr10)**
  - **Prepare build spec and drawings**

SSC AoA Schedule



SSC Technology Assessments

- In parallel with ICD and AoA
- BAAs
  - April 06 10 Phase 1 contracts – 3 months $200K
    - 2 concept studies; 8 technology areas
  - August 06 7 Phase 2 contracts – 12-15 months $1M
    - 2 concept studies; 5 technology areas
- Warfare center tasks
  - Market surveys
  - Technology assessments and development
  - LCAC lessons learned
- SBIRs shared with LCAC
- ONR cooperation
  - Skirts, Lift Fans, Materials
- Used for feasibility studies

SSC BAAs

VENDOR	TITLE of WHITE PAPER	PHASE 1	PHASE 2
Technology Systems, Inc	Augmented Reality Visualization of the Common Operational Picture	✓	
Alion Science and Technology	Hybrid ACV Propulsion	✓	
Goodrich	Composite Fan Propulsor Assembly	✓	✓
Textron Marine & Land Systems	JMAC Concept Study	✓	✓
Umoe Mandal	Concept Study	✓	✓
NG Electric Systems	Advanced Ducted Fan Design for Propulsion and Lift Fan Systems	✓	✓
Umoe Mandal	Fiber Reinforced Plastic	✓	
Rolls Royce	Marine Gas Turbine	✓	
Textron Marine & Land Systems	Notional JMAC Skirt Technology Development	✓	✓
NG Electric Systems	Comparison of Integrated Power Systems and Mechanical Drive: Options for JMAC Integration	✓	✓

ICD – Initial Capabilities Document

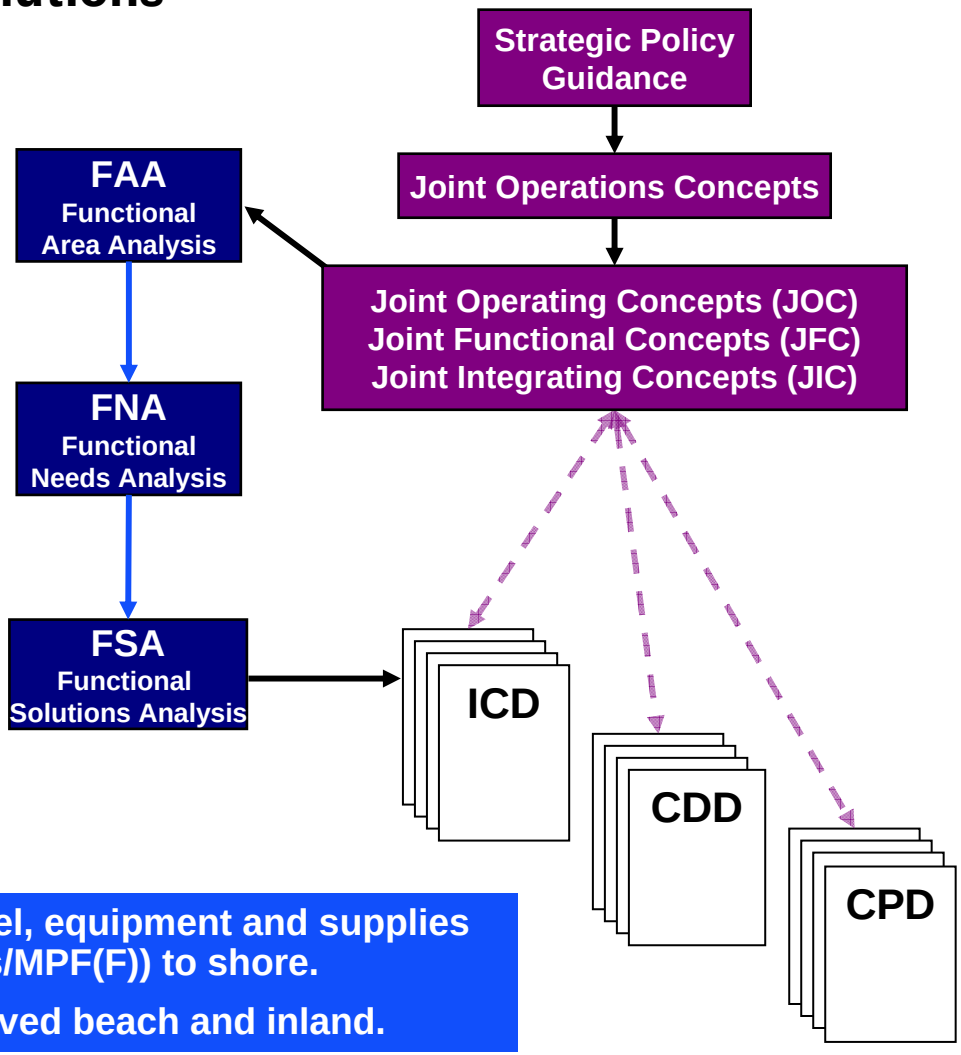
Identify Capability gaps requiring solutions

3 steps

FAA:
"…identifies the operational tasks, conditions, and standards needed to achieve military objectives."

FNA:
"…assesses the ability of current and programmed joint capabilities to accomplish tasks that the FAA identified"

FSA:
"…operationally based assessment of all potential DOTMLPF and policy approaches to solving (or mitigating) one or more of the capability gaps identified in the FNA"



This ICD focus … moving personnel, equipment and supplies from seabase (Amphibious/MPF(F)) to shore.

This includes over an unimproved beach and inland.

SSC Capabilities

- **Transport weapon systems, equipment, cargo and personnel of the assault element from Marine Air/Ground Task force and Army Brigade Combat Team (BCT)**
- **From existing and planned well deck Navy Amphibious Ships of >2015**
- **High speed (over 40 knots), high payload (~73 tons), and over-the-beach operations (clearing obstacles up to 4 feet)**

SSC Capabilities

- **Operational Environment**
  - **Day / Night**
  - **NATO Sea State 3-4 (significant wave height of 4.6 - 6.2 ft)**
  - **Non-permissive (not first wave)**
  - **Offshore 25 nm or greater**
  - **Over beaches, land, ice, mud, and marshes**
  - **Beach gradient = current LCAC or >LCAC**
  - **Temp range = current LCAC through hot Arabian Gulf (~120°F)**
- **Cycle time derived from 8-10 hours MEB offload**
- **Service Life: 20-30 years**

SSC Capabilities

1. Cross-deck of equipment and personnel occur at sea using Ship to Shore Connectors (SSCs) prior to conducting offensive operations. The term "cross-deck" is generally accepted as the movement of people and equipment from one ship or sea based platform to another.
2. Expeditionary Fighting Vehicles (EFV) come ashore at the landing penetration or beach landing point and provide security for follow-on forces.
3. Heavier follow on forces arrive by SSC to support the main effort.
4. SSCs conduct Non-Combatant Evacuation Operations (NEO) and transport non-combatants.
5. SSC communication between Expeditionary Strike Group (ESG), EFVs, other SSCs, and forces ashore.
6. Wounded personnel evacuated to ESG via SSC.
7. Logistic support from Maritime Sealift Command (MSC) shipping brought ashore by SSC over poorly accessible terrain.

Analysis of Alternatives Guidance

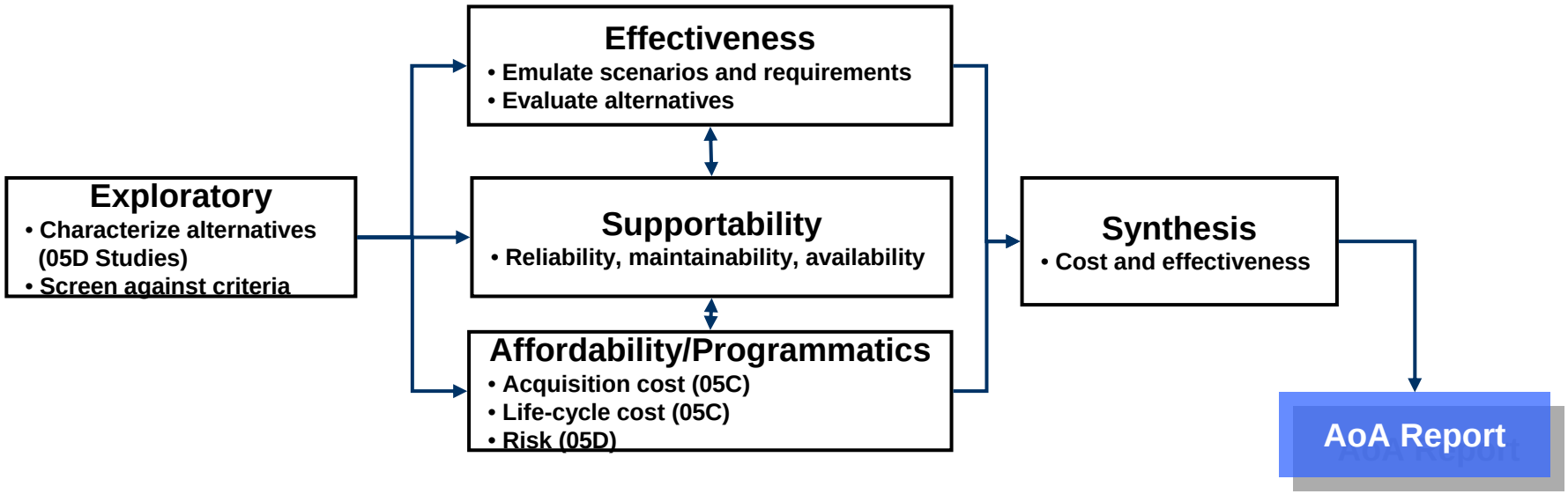
- **Purpose:**
  - **Determine optimum platform (or family of platforms) that fills capability gaps identified in the ICD within overarching constraints of acquisition and life-cycle costs**
  - **Develop methodology for determining quantities of required platforms**
  - **Develop metrics for capabilities specified in the ICD**
    - **Evaluate technologies and R&D investment options**
  - **Identify program cost drivers and cost-versus-capability trade space**

Force Composition, Size and Mix Determination

Analysis of Alternatives Guidance

... the AoA will include a multivariate analysis that uses legacy LCAC operational availability (Ao) and employment data to explore simultaneous trade-offs across key variables. At a minimum, the analysis should describe changes in cost and Ao with respect to the following vessel attributes: speed, lift capacity, maintainability, range, and surf zone access.

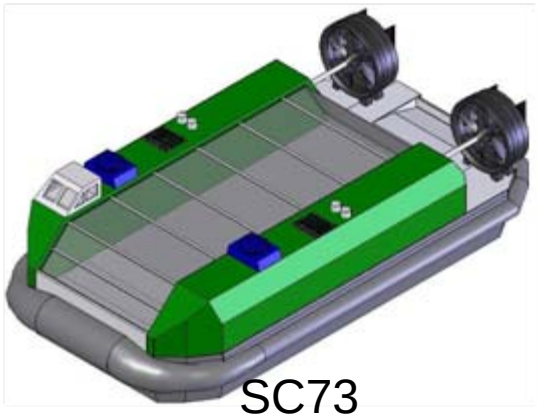
SSC AoA Methodology



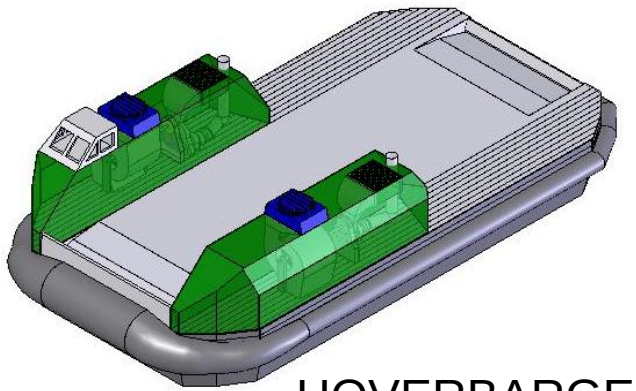
SSC: AoA Methodology

- **Exploratory (SEA 05D/CDI/CSC)**
  - **14 concepts designed**
    - **Air cushion vehicles**
    - **Displacement craft**
    - **Tracked and wheeled vehicles**
- **Effectiveness (AoA Study Director)**
  - **Accomplishment of defined missions using performance of each concept**
  - **Included combinations of the alternatives**
- **Supportability (SEA 05D and AoA Study Director)**
  - **RMA for each concept**
- **Affordability/Programmatics**
  - **Acquisition cost (SEA 05C)**
  - **Life-cycle cost (SEA 05C)**
  - **Risk (SEA 05D)**

SSC AoA Concepts



SC73



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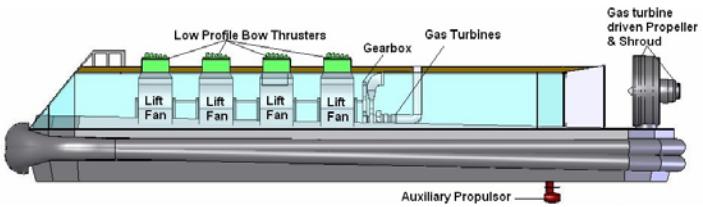
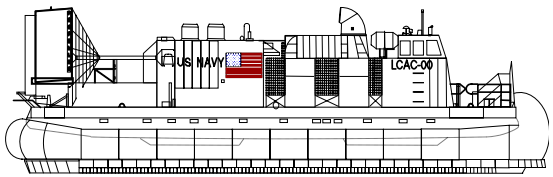
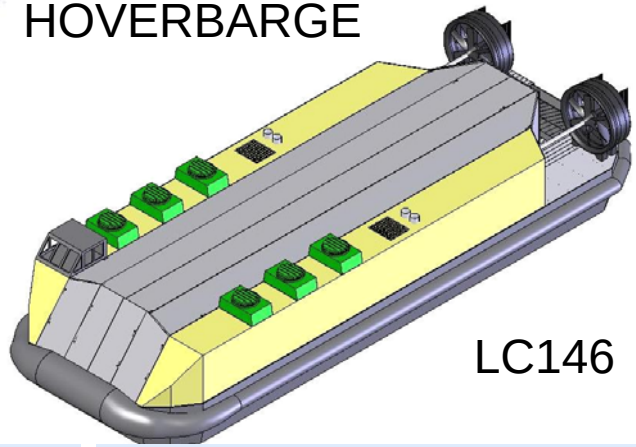


LH146

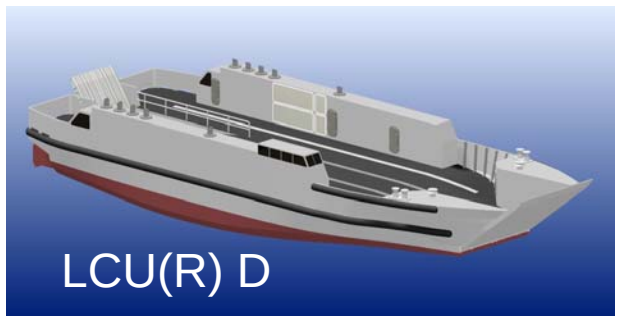


LCAC



LC146

LCU 1600



LCU(R) D

MONOCAT

SSC AoA Tools

- **New ACVs**
  - CDI–BLD ACV Synthesis Model
  - CAD model to verify Group 1 weights
  - Available gas turbines defined by Propulsion IPT
  - Group 4 defined by C4N IPT
  - 15% weight margin
- **New Construction LCAC SLEP**
  - Assumed can be built AS-IS
- **LCAC SLEP Comprehensive SLEP**
  - Work package defined with PMS 377J
- **LCU 1600 Modified Repeat – 2002 LCU(R) AoA Report**
- **New Displacement Craft**
  - LCU(R) Derivative – scaled from 2002 LCU(R) AoA concept
  - Monocat – scaled from earlier ONR concept
  - Group 4 defined by C4N IPT
  - 15% weight margin
- **New amphibious craft**
  - Scaled from LARC and EFV
- **Well deck strength assessment per 05P process**

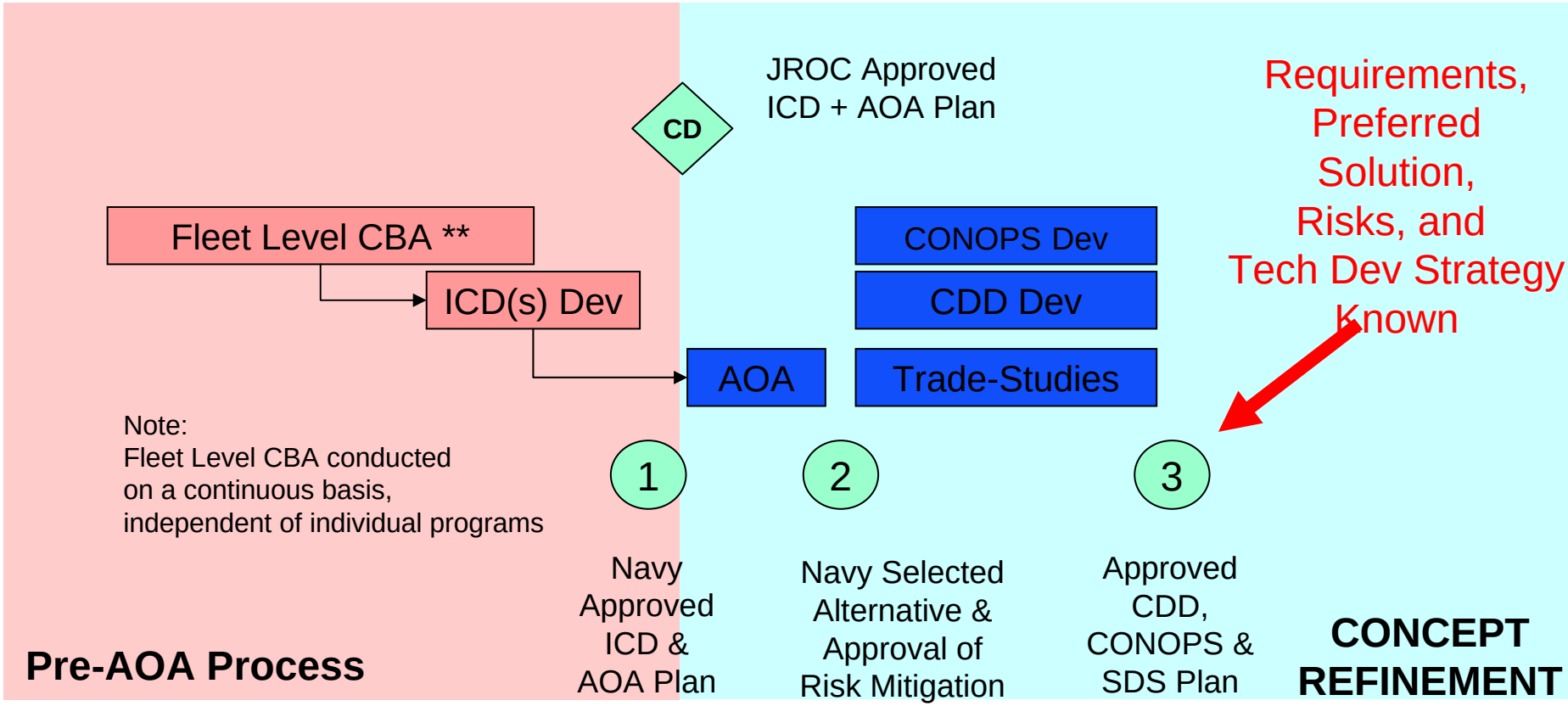
SSC AoA Synthesis

- **Down selected to three Alternatives:**
  - **LCAC SLEP - Comprehensive**
  - **73 Short Ton ACV**
  - **146 Short Ton ACV**
- **R3B:**
  - **Selected: 73 Short Ton ACV**

SSC AoA Design Issues

- **Process**
- **AoA design expectations**
  - **Performance predictions**
  - **TRL assessment**
  - **RMA assessment**
  - **Design Cost/Schedule estimating**
- **Design tools availability**
- **Data availability**
  - **Past designs**
  - **USA/USMC Vehicle data**

Proposed Implementation of SECNAVINST 5000.2D
PASS 1: SYSCOM LEAD



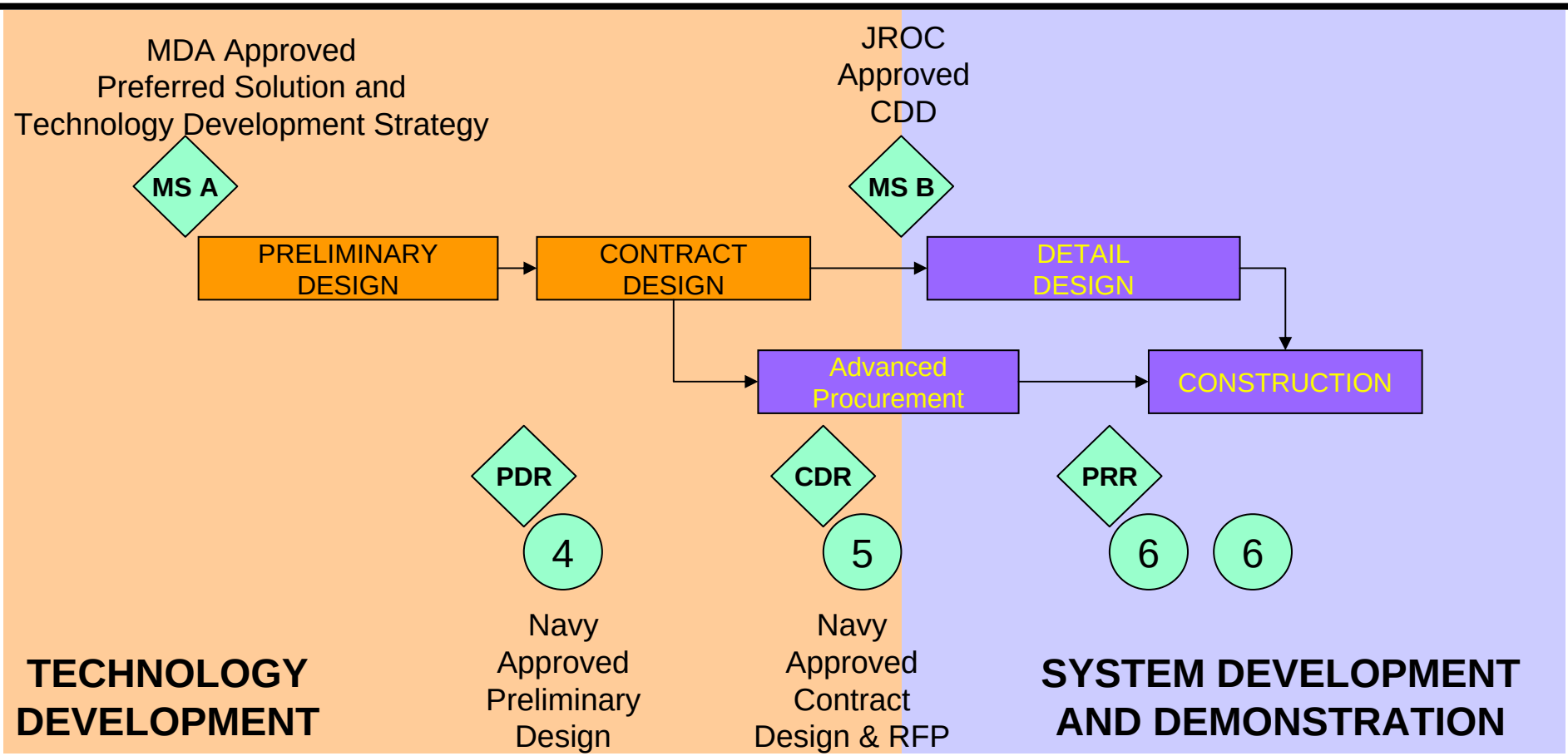
Methods / Activities

Concept Formulation Program / Design Space Exploration **

- Risk Identification
- Risk Management & Mitigation
- Response Surface Dev
- Set Based Design
- Business Case Analysis
- SDS Plan Dev
- Tech. Dev. Strategy Dev

** New Process

Proposed Implementation of SECNAVINST 5000.2D
PASS 2: PROGRAM OFFICE LEAD



Risk Management & Mitigation

Design Spiral with
Design Budget / Modularity /Flexibility Management

SDS Dev (TLR) | SDS Dev (TLS) | IBR

Technology Development Strategy Implementation

SSC AoA Overview Conclusion

- **SSC AoA partially used proposed implementation of SECNAVINST 5000.2D**
- **SSC AoA issues with:**
  - **AoA process**
  - **Design tools**
  - **Data availability**
- **Which issues are general and which were SSC AoA unique?**